

**COMMITTEE ON SCIENCE AND TECHNOLOGY
SUBCOMMITTEE ON ENERGY AND ENVIRONMENT
SUBCOMMITTEE REPORT**

July 28th, 2010

H.R. 5866

I. Purpose

The purpose of H.R. 5866, sponsored by Rep. Gordon, is to update the Department of Energy's nuclear energy research and development programs and provide necessary funding to advance nuclear technologies to adequately address the issues of high capital costs and waste management associated with nuclear power.

II. Background and Need for Legislation

Today in the United States there are 104 nuclear reactors producing approximately 20 percent of our nation's electricity supply and 70 percent of our emissions-free energy. However, nuclear power as it exists today relies on a "once-through" fuel cycle that produces high level radioactive waste from enriched uranium. In the United States, there exists a stockpile of approximately 63,000 metric tons of nuclear waste from reactors which generate roughly 2,000 more tons per year. Furthermore, the capital costs of nuclear plants have risen steeply and present a high hurdle to deployment of new reactors. Some have argued that without a fully developed strategy to deal with these challenges, nuclear power will be unable to compete with other fuel sources. Furthermore, in any carbon dioxide restrained regime, nuclear power will play a large role in energy production. To attain the 2030 reduction goals set in the American Clean Energy and Security Act, H.R. 2454, the Energy Information Administration estimated that at least 96 gigawatts of new nuclear capacity would be needed.

To address these challenges, the Nuclear Energy Research & Development Act of 2010 amends the Energy Policy Act of 2005 to modify and augment existing nuclear research and development programs at the Department of Energy. The primary goals of this bill are to mitigate the problems associated with nuclear waste and reduce the capital costs of nuclear power through a robust and integrated research, development, demonstration and commercial application program.

III. Subcommittee Actions

The Energy and Environment Subcommittee held a hearing on May 19th, 2010 to explore the Administration's strategy for research and development to advance clean and affordable nuclear technology. Amongst the issues considered were how the federal government will enhance the safety and economic viability of nuclear power and what programs it recommends for managing nuclear waste, advancing reactor design, sustaining the existing nuclear fleet, and minimizing risk of proliferation of nuclear materials.

Witnesses

Panel I

- **Dr. Warren P. Miller is the Assistant Secretary for the Office of Nuclear Energy at the U.S. Department of Energy.** Dr. Miller testified on the Department of Energy's recently released *Nuclear Energy Research and Development Roadmap* and provided additional guidance on the Office of Nuclear Energy's technology and innovation initiatives.

Panel II

- **Mr. Christofer Mowry is the President and CEO of Babcock & Wilcox Nuclear Energy, Inc.** Mr. Mowry testified on Small Modular Reactors and provided an overview of B&W's reactor operations. He provided information on the role Small Modular Reactors can play in reducing capital costs and improving the safety of nuclear power. Mr. Mowry also commented on DOE's *Nuclear Energy Research and Development Roadmap*.
- **Dr. Charles Ferguson is the President of the Federation of American Scientists.** The Federation of American Scientists (FAS) is a public policy think-tank that was originally founded by scientists from the Manhattan Project. Currently, FAS is conducting a project titled *The Future of Nuclear Energy in the United States* to explore and analyze the direction of nuclear energy technology innovation. Dr. Ferguson provided an overall analysis and critique of the *Nuclear Energy Research and Development Roadmap* and Small Modular Reactor technology.
- **Dr. Mark Peters is the Deputy Director for Programs at Argonne National Lab.** Dr. Peters testified on the *Nuclear Energy Research and Development Roadmap* with particular attention to the Administration's strategy for waste management technology. He also presented a summary of new waste management technologies currently under development at Argonne National Lab.
- **Mr. Gary M. Krellenstein is a Managing Director in JPMorgan's Energy and Environmental Group and is a former nuclear engineer at the Department of Energy and Nuclear Regulatory Commission.** Mr. Krellenstein's areas of focus are municipal utilities, Rural Electric Cooperatives, and alternative energy technologies and project financing. He is also involved in JPMorgan's "carbon" policies. Mr. Krellenstein testified on private capital interest in nuclear power including how Small Modular Reactors and other new technologies may attract private capital investment.
- **Dr. Thomas L. Sanders is the President of American Nuclear Society.** The American Nuclear Society is a nuclear professional society dedicated to promoting the awareness and understanding of the application of nuclear science and technology. Dr. Sanders provided an overall evaluation of the *Nuclear Energy Research and Development Roadmap* and provided recommendations of policy areas to more fully develop or explore.

The Subcommittee on Energy and Environment met to consider H.R. 5866 on July 28, 2010.

Mr. Baird offered a Manager's amendment to make technical corrections and conforming changes and to clarify how the cost share requirement included in the Small Modular Reactor program is to be calculated. *The amendment was agreed to by voice vote.*

Ms. Biggert offered an amendment to include in the list of objectives of the bill researching and developing technologies and processes so as to improve and streamline the process by which nuclear power systems meet Federal and State requirements and standards. *The amendment was agreed to by voice vote.*

Mr. Bartlett offered an amendment to require the Secretary to consult with and utilize the expertise of the Secretary of the Navy in carrying out the Small Modular Reactor program. *The amendment was agreed to by voice vote.*

Mr. Lujan offered an amendment to include in the project selection criteria of the Small Modular Reactor program those factors the Secretary must evaluate according to the program's Administration section. *The amendment was agreed to by voice vote.*

Ms. Biggert and Mr. Garamendi offered an amendment to require the Secretary to include additional advanced recycling and crosscutting activities. *The amendment was agreed to by voice vote.*

Mr. Garamendi offered an amendment to require the Secretary to research recycling including integral fast reactors in the Full Recycle Program. *The amendment was withdrawn.*

Mr. Inglis offered an amendment to require the Secretary to transmit a report to the Congress describing any plans to adopt recommendations of the Blue Ribbon Commission and to provide a response to each Blue Ribbon Commission recommendation, including a comparison to data from the Yucca Mountain Project. *The amendment was withdrawn.*

Ms. Johnson offered an amendment to require the Secretary to enter into a contract with the National Academies to conduct an evaluation of workforce and facility upgrades needed for the safe and reliable long-term operation of the Nation's nuclear power infrastructure. *The amendment was agreed to by voice vote.*

Mr. Matheson and Ms. Giffords offered an amendment to include minimization of water usage as a goal to be achieved by new technologies researched under the Small Modular Reactors program. *The amendment was agreed to by voice vote.*

Mr. Inglis moved that the Subcommittee favorably report H.R. 5866, as amended, to the Full Committee. *The motion was agreed to by voice vote.*

The following related hearings were also held in the 110th and 111th Congresses:

On June 17, 2009 a Full Committee hearing titled: *Advancing Technology for Nuclear Fuel Recycling: What Should Our Research, Development and Demonstration Strategy Be?* The purpose of this hearing was to explore the benefits and risks of nuclear waste recycling and address the technical challenges and policy objectives of a waste management strategy.

On April 23, 2008 a Full Committee hearing titled: *Opportunities and Challenges for Nuclear Power*. The purpose of this hearing was to explore the potential for nuclear to increase its share of the U.S. energy mix, [evaluate the capacity of]DOE's programs to support and advance nuclear technologies, and to discuss the challenges of high costs, waste disposal and proliferation concern.

IV. Section by Section Analysis

H.R. 5866 Nuclear Energy Research and Development Act of 2010

SECTION 1. SHORT TITLE

Nuclear Energy Research and Development Act of 2010

SECTION 2. OBJECTIVES

Amends Section 951(a) of the Energy Policy Act of 2005 to include the following objectives:

- (1) Reducing the costs of nuclear reactor systems
- (2) Reducing used nuclear fuel and nuclear waste products generated by civilian nuclear energy
- (3) Supporting technological advances in areas that industry is not likely to undertake because of technical and financial uncertainty

SECTION 3. FUNDING

Amends Section 951 of the Energy Policy Act of 2005 to provide the following authorizations for Subtitle E programs:

A. Total Program's Authorization

- (1) \$419,000,000 for fiscal year 2011
- (2) \$429,000,000 for fiscal year 2012; and
- (3) \$439,000,000 for fiscal year 2013.

B. Breakout of total Authorization for Activities under Section 953 for the Fuel Cycle Research and Development Program

- (1) \$201,000,000 for fiscal year 2011;
- (2) \$201,000,000 for fiscal year 2012; and
- (3) \$201,000,000 for fiscal year 2013.

- C. Breakout of total Authorization for Activities under Section 952 for Nuclear Energy Research and Development Programs other than those described in 952(d)
 - (1) \$64,000,000 for fiscal year 2011;
 - (2) \$64,000,000 for fiscal year 2012; and
 - (3) \$64,000,000 for fiscal year 2013.

- D. Breakout of total Authorization for Activities under Section 952(d) for the Small Modular Reactor Program
 - (1) \$55,000,000 for fiscal year 2011;
 - (2) \$65,000,000 for fiscal year 2012; and
 - (3) \$75,000,000 for fiscal year 2013.

- E. Breakout of total Authorization for Activities under Section 958 for the Nuclear Energy Enabling Technologies Program
 - (1) \$99,000,000 for fiscal year 2011;
 - (2) \$99,000,000 for fiscal year 2012; and
 - (3) \$99,000,000 for fiscal year 2013.

SECTION 4. NUCLEAR ENERGY RESEARCH AND DEVELOPMENT PROGRAMS

This section amends Section 952 of the Energy Policy Act of 2005 by striking subsections (c) through (e) and inserting a Reactor Concepts Program that authorizes research into advanced reactor designs and technologies to prolong the life of currently deployed reactor systems. Technologies that may be researched under this section include those that are economically competitive with other electric power generation plants, have higher energy efficiency, lower cost and improved safety compared to current reactors, utilize passive safety systems, minimize proliferation risks, reduce production of high-level waste per unit of output, increase the life and sustainability of deployed reactor systems, use improved instrumentation, or are capable of producing large-scale quantities of hydrogen or process heat. This section also requires the Secretary to seek opportunities for international cooperation.

SECTION 5. SMALL MODULAR REACTOR PROGRAM

This section amends Section 952 of the Energy Policy Act of 2005 by creating a Small Modular Reactor Program to promote the research, development, demonstration, and commercial application of small modular reactors (SMRs). Under this section, SMRs are defined as reactors with a rated capacity of 300MWe or less and can be constructed and operated in combination with similar reactors at a single site.

In conducting this Program, the Secretary may enter into cooperative agreements to support SMR designs that enable lower capital costs or increased access to private financing, reduced long-term radio-toxicity, mass, or decay heat of waste, increased operating safety of nuclear facilities, reduced dependence of reactor systems on water resources, increased seismic resistance of nuclear generation, reduced proliferation risk, and increased efficiency in reactor manufacturing.

To be eligible to enter into the agreement an applicant must submit a proposal that documents all partners and suppliers involved in the project and a description of anticipated domestic and international activities, the measures to be undertaken to enable cost-effective implementation of the SMR project, an accounting structure approved by the Secretary, and all known assets that shall be contributed to satisfy the non-Federal cost share requirement.

This program will require any applicant to be responsible for at least 50% of the cost of the project and that cost may only be satisfied through the use of non-Federal dollars.

In selecting winners of awards or cooperative agreements, the Secretary shall consider the domestic manufacturing capabilities of the parties and of their partners and suppliers, the viability of the reactor design and business plan of the parties, the potential of the reactor design to be developed without future federal subsidy, and the non-Federal share to be provided.

SECTION 6. FUEL CYCLE RESEARCH AND DEVELOPMENT

This section amends Section 953 of the Energy Policy Act of 2005 by renaming the program “Fuel Cycle Research and Development.” Under this program, the Secretary shall conduct fuel cycle research and development of technologies to improve uranium resource utilization, maximize energy generation, minimize nuclear waste creation, improve safety, and mitigate risk of proliferation in support of a national strategy for spent nuclear fuel.

The fuel management options that may be considered under this program are open fuel cycle, modified open cycle, full recycle, advanced storage, alternative storage, or other appropriate technology areas. Open fuel cycle includes development of fuels for use in reactors that minimize waste creation. Modified open cycle includes development of fuel forms, reactors and limited separations of waste. Full recycle includes development of technologies to repeatedly recycle nuclear waste products to minimize total waste to the greatest extent possible. Advanced storage includes development of innovative storage technologies for both onsite and long-term storage. Alternative storage includes development of innovative long-term storage methods, including deep borehole storage or salt dome storage.

Furthermore, under this section, the Secretary must consider the final Blue Ribbon Commission report. Within 180 days after the release of the Blue Ribbon Commission Report, the Secretary must transmit to Congress a report describing any plans the Department may have to incorporate relevant recommendations from the Commission.

SECTION 7. NUCLEAR ENERGY ENABLING TECHNOLOGIES

This section amends the Energy Policy Act of 2005 by adding a new section 958 titled “Nuclear Enabling Technologies.” This program is to support integration of activities undertaken in 952(c) and 953 and support crosscutting technology development. Research activities may include those pertaining to advanced reactor materials, catastrophic radiation mitigation methods, proliferation and security risk assessment methods, sensors and instrumentation, manufacturing methods, or any crosscutting technology or transformative concept the Secretary deems relevant.

In conducting this program, the Secretary must submit a report on and evaluation of these activities as part of the annual budget.

SECTION 8. EMERGENCY RISK ASSESSMENT AND PREPAREDNESS REPORT

This section requires the Secretary to transmit to the Congress a report summarizing quantitative risks associated with the potential of a severe accident arising from the use of nuclear power and outlining the technologies currently available to mitigate the consequences of such an accident. The report shall include recommendations of areas of technological development that should be pursued to reduce the public harm arising from such an incident.

SECTION 9. NEXT GENERATION NUCLEAR PLANT

This section amends Section 642(b)(3) of the Energy Policy Act of 2005 to allow the location of the prototype power plant to be constructed in a location chosen by the Consortium through an open and transparent competitive selection process.

This section also requires GAO to undertake a report to provide a status update on the Next Generation Nuclear Plant (NGNP) indicating its progress, how Federal appropriated funds have been distributed and spent, and the current and expected participation by non-federal entities. The report shall also include an analysis of various challenges facing the NGNP project.

SECTION 10. TECHNICAL STANDARDS COLLABORATION

This section requires the Director of the National Institute of Standards and Technology (NIST) to establish a nuclear energy standards committee to facilitate and support the development or revision of technical standards for new and existing nuclear power plants and advanced nuclear technologies.

The committee shall include representatives from the Federal Government and the private sector and the committee shall be co-chaired by a representative from NIST and a representative from a private sector standards organization.

The duties of the committee shall include: (1) performing a technical standards needs assessment; (2) formulating, coordinating, and recommending priorities for new technical standards and the revision of existing technical standards; (3) facilitating and supporting collaboration and cooperation among standards developers; (4) coordinating with other national, regional, or international efforts on nuclear energy-related technical standards; and (5) promoting the establishment and maintenance of a database of nuclear energy-related technical standards.

\$1 million is authorized to carry out this section for each of FY 2011 through FY 2013.

SECTION 11. EVALUATION OF LONG-TERM OPERATING NEEDS

This section requires the Secretary to contract with the National Academies to conduct an evaluation of the long-term operating needs of currently deployed nuclear reactors. This report must be submitted no later than one year after enactment of this act.